

# RESERVED COPY PATENT SPECIFICATION

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## COMPLETE SPECIFICATION

### Improvements in Grinding Machines

I, JOHAN OLOV LARSSON, a Swedish Subject, of Linnevagen 6, Gavle, Sweden, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention, relates, to grinding machines for wood chips or the like, of the kind comprising mutually rotatable grinding members which are displaceable with respect to each other in the direction of the axis of rotation, said grinding members defining between them a pre-grinding zone tapering in cross-section and increasing in diameter in the direction of feed, and a fine-grinding zone positioned after said pre-grinding zone and extending transversely to the said axis of rotation.

It is an object of the invention to provide such improvements in grinding machines of the kind indicated above that a change of the grinding fineness, i.e., of the grinding conditions in the fine-grinding zone, can be obtained through axial displacement of the grinding members with respect to each other without simultaneously appreciably changing the grinding conditions in the pre-grinding zone.

According to the invention, a grinding machine of the aforesaid kind is characterised in that the grinding members are so shaped that a straight line passing through the ends of the generatrix for the inner of the mutually co-operating grinding surfaces in the pre-grinding zone is inclined at an angle of not more than 30° to the axis of rotation and these surfaces merge smoothly with the co-operating grinding surfaces in the fine-grinding zone.

On axial displacement of the grinding members with respect to each other in a grinding machine designed in this manner the change in the distance between the transversely extending fine-grinding surfaces

will be equal to or substantially equal to the displacement, whereas the change in distance between the grinding surfaces in the pre-grinding zone will be only a fraction of the said displacement on account of the comparatively small slope of said surfaces with respect to the direction of displacement.

The invention will now be described in more detail and with reference to the accompanying drawing, which shows, by way of example, a grinding machine having a vertical shaft.

In the drawing, the reference numeral 10 designates a hermetically closed housing of the grinding machine and 11 a rotatable grinding member provided therein, the rotatable grinding member 11 being secured at the upper end of a vertical shaft 12 which passes up through the bottom of the grinding housing. The material to be ground is pressed into the grinding housing 10 at the top thereof from a hopper 14 by means of a machine-driven horizontal feeding screw 13. By means of a tube connection 15, the interior of the grinding housing 10 can be put in communication with a steam pressure source, not shown. The reference numeral 16 designates a sealing box for the shaft 12.

Outside the grinding housing 10, the vertical shaft 12 is rotatably journaled in an upper radial ball bearing 17, which is slidable in a stationary guide sleeve 18 in the direction of the shaft, and also in a lower radial ball bearing 19, fitted in a bearing housing 20 which is slidable in the direction of the shaft in a stationary guide sleeve 21. The lower end of the shaft 12 is supported by means of an axial ball bearing 22 mounted in the bearing housing 20 on the shorter arm of a two-armed lever 23, which is pivotal about a fixed horizontal bearing pin 24. Engaging the end of the long arm of the lever 23 is a vertical rod 25, which is pressed downwardly by a spring 26. The tension in the spring 26, which at its lower end

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bears against a fixed collar 27 on the rod 25 and at its upper end engages the underside of a threaded adjusting sleeve 28, can be changed by turning the sleeve 28 by means 5 of a hand wheel 29.

In place of the spring-operated pressing device described above, a hydraulic pressing device, as indicated at 30, can be used.

The grinding member shaft 12 is driven from 10 an electric motor 31 by means of a rope drive 32.

As clearly shown in the drawing, the central portion of the upper part of the grinding housing 10 is shaped as a cone having a 15 comparatively small top angle, i.e., the generatrix of the conical surface forms a small angle with the vertical axis of rotation. A suitable value for the angle is about, but less than,  $30^\circ$ .

20 The corresponding parts of the rotatable grinding member or body 11 are also substantially conically shaped, but the straight line joining the ends of the generatrix of the grinding surface of the said member forms a 25 larger angle, but not more than  $30^\circ$ , with the axis of rotation, so that there is formed between the conical grinding housing wall and the conical part of the rotatable grinding member a pre-grinding zone 33 which con- 30 verges at an angle of about  $3^\circ$  from the feeding end for the material to be ground.

The fine-grinding zone positioned after the pre-grinding zone 33 is formed between two annular grinding members 34 and 35, which 35 are detachably secured to the grinding housing 10 and a downwardly and outwardly extending portion of the rotatable grinding body 11 respectively, said annular grinding members having plane grinding surfaces 40 which lie in a plane at right angles with the axis of rotation.

The degree of fineness of the ground material discharged from the grinding machine is obviously determined by the distance 45 between the transversely extending grinding surfaces of the grinding members 34 and 35; a change of this distance through axial displacement of the grinding body 11 with respect to the grinding housing 10 results 50 in only a slight change in the distance between the sloping grinding surfaces in the pre-grinding zone.

The grinding surfaces in the pre-grinding zone 33 may be provided in a manner 55 known *per se* with spiral-shaped ridges or raised portions shaped in any other manner, and the transversely extending grinding surfaces of the grinding members 34 and 35 defining the fine-grinding zone may be made

rough in a similar or other manner to improve 60 the grinding effect.

For the continuous discharge of the ground pulp or other substance from the grinding housing 10 a discharge valve of any suitable kind may be used. However, it is particularly 65 advantageous to use a discharge valve of the kind described and claimed in the Complete Specification of my co-pending Application No. 21632/53 (Serial No. 734,733).

What I claim is:—

70 1. A grinding machine for wood chip-pings or the like, having mutually rotatable and axially displaceable grinding members which between them define a pre-grinding zone tapering in cross-section and increasing 75 in diameter in the direction of feed, and a fine-grinding zone positioned after said pre-grinding zone and extending transversely to the axis of rotation, characterised in that the grinding members are so shaped that a 80 straight line passing through the ends of the generatrix for the inner of the mutually co-operating grinding surfaces in the pre-grinding zone is inclined at an angle of not more than  $30^\circ$  to the axis of rotation and 85 these surfaces merge smoothly with the co-operating grinding surfaces in the fine-grinding zone.

2. A grinding machine according to Claim 1, characterised in that each of said grinding 90 members comprises separate grinding surfaces for the pre-grinding zone and for the fine-grinding zone.

3. A grinding machine according to Claim 2, characterised in that the grinding members 95 in the fine-grinding zone consist of rings having a plane grinding surface, said rings being detachably secured on the inside of a grinding housing, and on a grinding member carried by a rotatable shaft respectively. 100

4. A grinding machine according to Claim 1, 2 or 3, characterised by the provision of means for resiliently pressing the grinding members towards each other in the direction 105 of the axis of rotation and with a variable pressing force.

5. A grinding machine constructed, arranged and adapted to operate substantially as hereinbefore described with reference to, and as shown in, the accompanying drawing. 110

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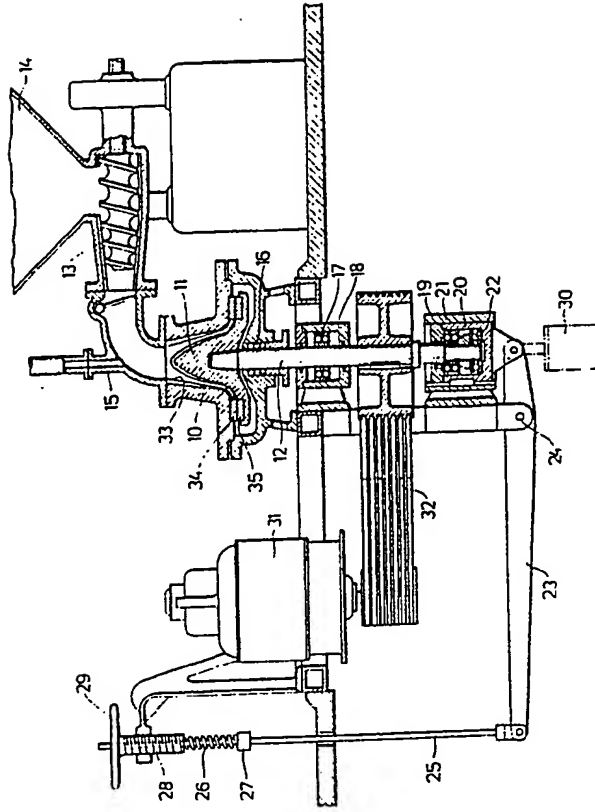
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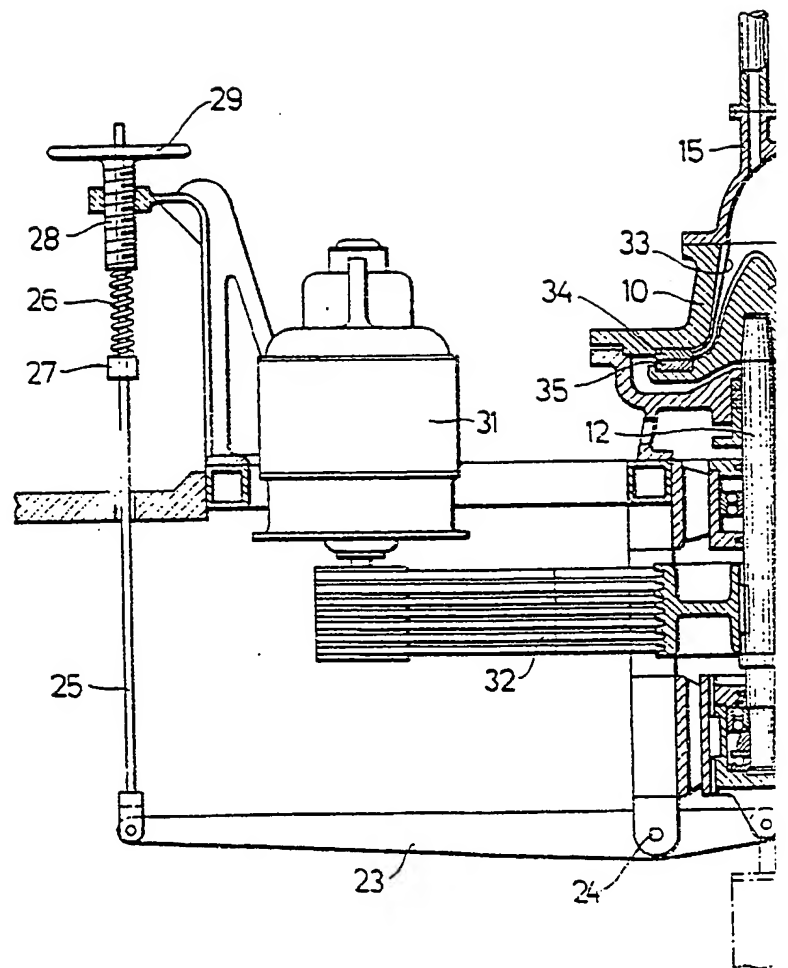
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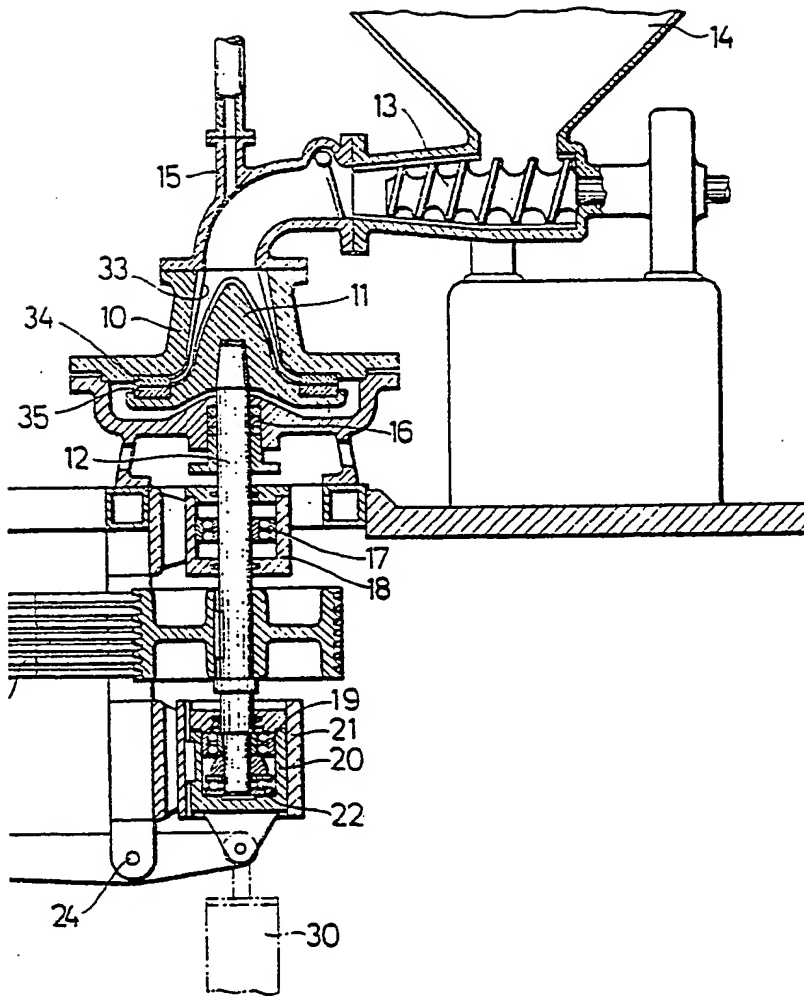


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COMPLETE SPECIFICATION

1 SHEET

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